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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/623,985	KONEN ET AL.
	Examiner	**Art Unit**
	Hussein Akhavannik	2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-55 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-55 is/are rejected.

7)☒ Claim(s) 7 and 47 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 17 April 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 6.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or
REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
(e) BACKGROUND OF THE INVENTION.
(1) Field of the Invention.
(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(f) BRIEF SUMMARY OF THE INVENTION.
(g) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(h) DETAILED DESCRIPTION OF THE INVENTION.
(i) CLAIM OR CLAIMS (commencing on a separate sheet).
(j) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(k) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

2. The disclosure is objected to because of the following informalities:

On page 18, line 1, "step S130" should be changed to "step S230" in order to correspond with figure 2.

Appropriate correction is required.

3. A clean copy of the specification should be submitted because the current copy contains many smudges and extraneous marks, which may affect the scanning of the application.

Claim Objections

4. Claims 7 and 47 are objected to because of the following informalities:

Referring to claim 7, "extent." should be changed to "extent," in line 2.

Referring to claim 47, "one of the lower and the right and lower head boundaries" is improper since the lower head boundary is stated twice.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-55 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Referring to claim 1, this claim recites, "intrinsic movements are detected" in line 6. The Examiner is unable to understand the meaning of intrinsic movements. For example, Wagner et al define intrinsic movements as the lineaments of an individual in column 4, lines 16-33. It is understood that the pattern of the lips used by Wagner et al for an individual speaking is intrinsic

to the individual and may be measured by a CCD camera. However, it is not understood how a pattern of the eyes or the nose is intrinsic to an individual (as suggested in claim 18). The Applicant has not disclosed which patterns in the eye or nose region are intrinsic to an individual or how the can be accurately measured using a CCD camera in the specification.

Referring to claims 2-55, these claims are indefinite for depending from an indefinite antecedent base claim.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 7-8, 43-44, and 54-55 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recited the limitation "the function" in lines 3 and 6. There is insufficient antecedent basis for this limitation in the claim.

Claim 8 is rejected for depending from an indefinite antecedent base claim.

Claim 43 recites the limitation "the sum of the gray level" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 44 recites the limitation "the binarized differential image" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 54 recites the limitation "the sum of the gray level" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 55 recites the limitation "the binarized differential image" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

10. Claims 1, 17-18, 22, and 27-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Wagner et al (U.S. Patent No. 6,101,264).

Referring to claim 1,

i. Recording a sequence of consecutive individual images of the person is illustrated by Wagner et al in figure 1 by the video camera (10).

ii. Determining the authenticity of the recorded image if in at least two consecutive individual images of the sequence intrinsic movements are detected is explained by Wagner et al in column 4, lines 16-33 and illustrated in figure 2. Wagner et al explain that the facial mimicry (intrinsic movements) imaged are compared with those of a set of "stored individuals" in order to reliably authenticate the recorded image. Wagner et al

illustrate in figure 2 that five consecutive individual images are used to determine authenticity.

Referring to claim 17, the intrinsic movements to be determined are intrinsic movement in the head region of the person the be identified is illustrated by Wagner et al in figure 2, wherein the face is in the head region of the person being identified.

Referring to claim 18, the intrinsic movements to be determined are intrinsic in at least one of the group consisting of the mouth region, the cheek region, the nose region, and the eye region of the person to be identified is illustrated by Wagner et al in figures 3 and 6 by the mouth region.

Referring to claim 22, extracting regions from the individual images in which intrinsic movements are expected prior to detection of authenticity is illustrated by Wagner et al in figure 3 and explained in column 4, lines 21-23. Wagner et al explain extracting only a section of the face image before evaluating the facial mimicry from the individual images. In figure 3, Wagner et al clearly illustrate that the digital image sequence containing only the mouth region is extracted before the flow sequence and classification processes are performed.

Referring to claim 27, the head region of the person to be identified being extracted is illustrated by Wagner et al in figure 2, wherein the face is in the head region of the person being identified.

Referring to claim 28, the extracted head region for identifying the person being transformed to a predetermined standard size is illustrated by Wagner et al in figure 6. Wagner et al illustrate six extracted head regions from six consecutive frames, which are each the same predetermined size.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 2, 4, 6, 9-10, 19, 21, 23, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Badiqué (U.S. Patent No. 5,570,434).

Referring to claim 2, determination of the intrinsic movements comprises evaluating at least one differential image of two consecutive individual images of the sequence is not explicitly explained by Wagner et al. However, Badiqué explains determining a difference picture in column 3, line 65 to column 4, line 2. Badiqué explains in the abstract that the difference image is created in order to determine the areas of a recorded image that correspond to a moving object in the head region of a person. The difference image determines the magnitude of motion between two frames efficiently. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use differential images, as explained by Badiqué, in order to quickly and accurately determine the regions of movement in the recorded images of the face in the system of Wagner et al.

Referring to claim 4, each differential image being binarized prior to evaluation is not explicitly explained by Wagner et al. However, Badiqué explains in column 4, lines 9-27 that the difference image is binarized. For each block of the difference image, the sum of all the picture elements is compared to an optimized threshold and if the sum is greater than the threshold, a binary one is assigned to the block. After processing all the blocks on the difference

image, the difference image will be completely binarized. By binarizing the difference image, the processing required to evaluate the difference image will be reduced, because less information about the image is retained. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to binarize each difference image in the system of Wagner et al and Badiqué in order to reduce computation complexity during evaluation of the images.

Referring to claim 6,

i. Selecting at least one section of enhanced movement is each differential image is explained by Wagner et al in column 4, lines 21-25.

ii. Detecting intrinsic movements if at least one section in the differential image is consistent with a predetermined region in which intrinsic movements are expected is explained by Wagner et al in column 4, lines 25-33. Wagner et al explain that comparative values are calculated based on the detected movements and the movements of "stored individuals" (corresponding to regions in which intrinsic movements are expected). In the system of Wagner et al, the predetermined region corresponds to the mouth region and the section may be selected from the differential image of Badiqué, corresponding to claim 2.

Referring to claim 9,

i. The sections chosen from the differential image being expected to have a symmetrical relationship with one another is not explicitly explained by Wagner et al. However, Badiqué explains that a mouth region, such as the mouth region extracted by Wagner et al, is mirror-symmetrical in column 11, lines 5-8.

ii. Intrinsic movements being detected when the symmetrical relationship is verified by a correlation analysis of the corresponding sections is not explicitly explained by Wagner et al. However, Badiqué explains examining how far (correlation amount) the mouth (or eye) region is mirror-symmetrical in column 11, lines 5-8. The correlation amount is used in order to determine the weight assigned to the triplet (corresponding to the determined image of the face as explained in column 10, lines 38-45). Thus, if the corresponding sections exhibit a greater symmetry, a higher weight is assigned to the triplet, thereby increasing the probability that accurate intrinsic movements are detected. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the degree of symmetry between corresponding sections of the differential image in order to more accurately detect intrinsic movement to authenticate a user.

Referring to claim 10, the intrinsic movements being detected if it is determined by way of a correlation analysis that the enhanced movement in the region of enhanced movement is irregularly distributed over the region is illustrated by Wagner et al in figure 6 and explained in column 5, lines 36-48. The region of enhanced movement, corresponding to the mouth area, is irregularly distributed due to the different directions exhibited by the motion vectors.

Referring to claim 19, the intrinsic movements determined being intrinsic movements in at least two regions that are in symmetrical relationship with each other in the head region of the person to be identified and the two symmetrical regions being used to determine the axis of symmetry of the head region is not explicitly explained by Wagner et al. Wagner et al explain that the intrinsic movements are determined from the mouth region, which is symmetric, but

constitutes only one region. However, Badiqué explains determining the movement of the eye regions of a face, the degree of symmetry between the eye regions, and the center axis (corresponding to the axis of symmetry) in column 10, line 56 to column 11, line 23 and illustrates the regions and the axis in figure 10. Badiqué explains that the regions of the eyes and mouth are selected because they exhibit frequent and fast movement. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine intrinsic movement in at least two regions that are symmetric with each other in the head region and determine the axis of symmetry so that intrinsic movement can be identified in those regions that exhibit frequent motion in the face.

Referring to claim 21,

i. Producing an image of the person to be identified with the help of the axis of symmetry found is not explicitly explained by Wagner et al. However, Badiqué explains determining the center axis (corresponding to the axis of symmetry) in column 10, line 56 to column 11, line 23 and illustrates the axis in figure 10.

ii. The image being usable for identifying the person and being composed of the left head region and the mirrored left head region or of the right head region and the mirrored right head region is not explicitly explained by Wagner et al. However, it is inherent in the system of Badiqué that the axis of symmetry separates the symmetric left and right head regions. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to identify a person using an image composed of left head region and mirrored left head region or of the right head region and the mirrored

right head region in order to reduce the amount of data being processed, thereby saving computation power.

Referring to claim 23, extracting the region comprising evaluating at least one differential image of two consecutive individual images of the sequence corresponds to claim 2. The system of Wagner et al extracts sections of the face image that exhibit movement (or facial mimicry) as explained in column 4, lines 16-33. The system of Badiqué determines the areas of motion in the facial images by evaluating at least one differential image, corresponding to claim 2.

Referring to claim 25, each differential image being binarized prior to evaluation corresponds to claim 4.

13. Claims 3 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Badiqué, and further in view of Matsunaga (U.S. Patent No. 5,161,018).

Referring to claim 3, the determination of the intrinsic movements comprises evaluating at least one differential image evaluated that results from an AND operation of two consecutive differential images is not explicitly explained by Wagner et al or Badiqué. However, Matsunaga explains performing an AND operation on two differential images in column 3, lines 47-56. Matsunaga performs this operation in order to reduce the noise in the motion estimation as explained in column 4, lines 16-22. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform an AND operation of two consecutive differential images in order to reduce noise in the resultant image.

Referring to claim 24, evaluating a differential image that results from an AND operation of two consecutive differential images corresponds to claim 3.

14. Claims 5 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Badiqué, and further in view of Dunton et al (U.S. Patent No. 6,678,393).

Referring to claim 5, the binarization being carried out by means of a threshold value which is determined by evaluating the background is not explicitly explained by Wagner et al or Badiqué. However, Dunton et al explain that a threshold value for image segmentation is determined by evaluating a background in column 6, lines 4-15. By determining a threshold to be higher than the background level, only the image information concerning the foreground is processed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to binarize a difference image by means of a threshold value determined by evaluating the background, so that only the information outside of the foreground is discarded.

Referring to claim 26, binarization being carried out by means of a threshold value which is determined by evaluating the background corresponds to claim 5.

15. Claims 7-8 and 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Badiqué, and further in view of Ueno et al and Russ (Russ, J.C., "The Image Processing Handbook." Second Edition. Boca Raton: CRC Press. 1995. Pp. 216-220).

Referring to claim 7,

i. The section having vertical and horizontal extent is illustrated by Wagner et al in figure 3 by the digital image sequence, which inherently has a vertical and horizontal extent.

ii. The vertical extent is substantially determined by a peak of the function of the products from the horizontal projections with the horizontal variances of the differential

image is not explicitly explained by Wagner et al or Badiqué. However, Ueno et al illustrate determining the vertical extent of a head from a projection of a binarized frame difference signal in figures 7A and 7C. The peak of the projection occurs in between the transition points, as the head region falls between the transition points. Ueno et al do not explain the function being a product of the horizontal projections and the horizontal variances. Russ et al explain on page 219 that an image histogram may be equalized by dividing each horizontal or vertical projection by the number of horizontal or vertical projections. The number of horizontal or vertical projections is the first term of the calculation of the variance (as explained in the specification on page 20, equation 3 and 4). Thus, equalizing a histogram by multiplying the values of the horizontal projections by the horizontal variance corresponds to equalization process explained by Russ.

iii. The horizontal extent is substantially determined by a peak of the function of the products from the vertical projections with the vertical variances of the differential image is not explicitly explained by Wagner et al or Badiqué. However, Ueno et al illustrate determining the horizontal extent of a head from a projection of a binarized frame difference signal in figures 7A and 7B. The peak of the projection occurs in between the transition points, as the head region falls between the transition points. Ueno et al do not explain the function being a product of the vertical projections and the vertical variances. Russ et al explain on page 219 that an image histogram may be equalized by dividing each horizontal or vertical projection by the number of horizontal or vertical projections. The number of horizontal or vertical projections is the first term of the calculation of the variance (as explained in the specification on page 20, equation 3 and 4). Thus,

equalizing a histogram by multiplying the values of the vertical projections by the vertical variance corresponds to equalization process explained by Russ. Ueno et al explain binarizing the difference image in column 7, lines 7-16 in order to identify the regions exhibiting a change between frames (interframe). Such histogram processing is well known in the art to identify regions which exhibit motion using reduced computational power. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the vertical and horizontal extent of a portion of an image, such as the mouth region in the system of Wagner et al and Badiqué, using the peak of the projection of the binarized difference images, as explained by Ueno et al and Russ, in order to efficiently determine the portions of the captured images that exhibit motion.

Referring to claim 8, each function is smoothed with a low-pass filter prior to the determination of the corresponding peak is not explicitly explained by Wagner et al. However, Badiqué explains a smoothing filter in order to reduce noise in column 5, lines 26-30 and Ueno et al illustrated a low-pass filter that reduces noise in figure 1 by reference number 103. In both systems the noise reduction filtering is performed before the determination of the peak of the projection of the difference image. It would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth consecutive images before determining the peak of the projection of a difference image created from the consecutive images, so that false peaks due to noise do not adversely affect the results of the determination.

Referring to claim 11,

i. A function which depends on the vertical position and which is determined for a given vertical position through the product from the horizontal projection with the horizontal variance of the differential image corresponds to claim 7ii.

ii. A function which depends on the horizontal position and which is determined for a given horizontal position through the production from the vertical projection with the vertical variance of the differential image corresponds to claim 7iii.

Referring to claim 12, each function being smoothed with a low-pass filter corresponds to claim 8.

Referring to claim 13,

i. At least one peak being determined in the function depending on the vertical position and at least one peak being determined in the function depending on the horizontal position is not explicitly explained by Wagner et al or Badiqué. However, Ueno et al illustrate in figures 7B and 7C that the peaks are determined for the vertical function and the horizontal function.

ii. Intrinsic movements being detected if the peaks in the vertical and horizontal direction are within predetermined limits that are given by the vertical and horizontal extent of at least one region in which intrinsic movements are to be expected is not explicitly explained by Wagner et al or Badiqué. However, Ueno et al illustrate in figure 7B and 7C that the peaks must be within the limits of the horizontal and vertical extent defined by the axis of the functions, which is defined by the image size. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to detect intrinsic movements only if the peaks of the vertical and horizontal

direction are within the predetermined limits, defined by the image size in the system of Ueno et al, so that erroneous intrinsic movement located outside of the image is avoided.

Referring to claim 14,

i. The being expected to have a symmetrical relationship with one another on the basis of the function depending on at least one of the vertical position and the function depending on the horizontal position corresponds to claim 9i.

ii. Intrinsic movements are detected when the symmetrical relationship is verified by a correlation analysis of the corresponding sections corresponds to claim 9ii.

Referring to claim 15, the section being expected to be in a symmetrical relationship being standardized with respect to each other prior to the correlation analysis is not explicitly explained by Wagner et al. However, Badiqué explains that the eye and mouth regions are weighted in column 11, lines 24-26. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to standardize the sections expected to be in a symmetrical relationship so that the relationship can be determined more accurately.

Referring to claim 16, evaluating at least one of the function depending on the vertical position and the function depending on the horizontal position and detecting intrinsic movements if it is determined by way of a correlation analysis that the values of at least one of the function depending on the vertical position and of the function depending on the horizontal position are irregular over a predetermined region corresponds to claim 10.

16. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Badiqué, and further in view of Prasad (U.S. Patent No. 5,625,704).

Referring to claim 20, producing an image which can be used for identifying a person and in which a fronttoparallel rotated head region is transformed into a head region with a rotated axis of symmetry is not explicitly explained by Wagner et al or Badiqué. However, Prasad illustrates rotating a head region along the axis of symmetry in figure 1. By rotating the head image, only half of the head region remains to be processed in the system of Prasad. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to rotate a head region with a rotated axis of symmetry in order to reduce the computation power required to process the head image.

17. Claims 29-35, 37-38, 40, and 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Ueno et al (U.S. Patent No. 5,150,432).

Referring to claim 29, extracting the head region comprising determining at least two head boundaries in the corresponding individual images, on the basis of which the head region is extracted from the corresponding individual images is not explicitly explained by Wagner et al. However, Ueno et al illustrate extracting four head boundaries from a difference image in figure 5. Ueno et al also illustrated the extracted head region, determined by the head boundaries in figure 7A. In order to extract a four-sided head region from a captured image, such as the digital image sequence of Wagner et al, four head boundaries are required. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to extract a head region by determining at least two head boundaries, so that the movements of the head can be analyzed without processing the entire captured image.

Referring to claim 30, the head boundary in the corresponding individual images comprising the upper and lower head boundary corresponds to claim 29. Ueno et al clearly illustrate an upper head boundary (Ys) and a lower head boundary (Ye) in figure 5.

Referring to claim 31, the head boundary in the corresponding individual images comprising determining the upper, the left, and the right head boundary corresponds to claim 29. Ueno et al clearly illustrate an upper head boundary (Ys), a left head boundary (Xs), and right head boundary (Xe) in figure 5.

Referring to claim 32, the head boundary being defined by a head boundary line which extends such that the contour of the head is positioned substantially within the head boundary lines corresponds to claim 29. Ueno et al clearly illustrate that the contour of the head is within the four head boundary lines in figure 5.

Referring to claim 33,

i. Determining a function of the vertical projections of a binarized differential image is not explicitly explained by Wagner et al. However, Ueno et al illustrate a function of the vertical projections of a binarized differential image in figure 7C.

ii. Defining the left head boundary by the first maximum of the absolute value of the first derivative of the function that is above a predetermined threshold value is not explicitly explained by Wagner et al. However, Ueno et al explain that the transition points are only determined if the value of a vertical projection is above a threshold in column 7, lines 17-20. Ueno et al also illustrate in figure 7C that the first transition point is selected at the maximum of the absolute value of the first derivative of the function of vertical projections. In figure 7C, the top transition point is selected at the point where

the slope (corresponding to the absolute value of the first derivative) is at a maximum. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the top head boundary by the first maximum of the absolute value of the first derivative of the function that is above a predetermined threshold value, since the increase in the slope of the function of a difference image indicates the start of an area of motion.

Referring to claim 34, the function of the vertical projections being smoothed with a low-pass filter prior to defining the head boundary is not explicitly explained by Wagner et al. However, Ueno et al illustrate a low-pass filter that reduces noise in figure 1 by reference number 103. The noise reduction filtering is performed before the determination of the peak of the projection of the difference image. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth the function of the vertical projections prior to defining the head boundaries, so that false peaks due to noise do not adversely affect the head boundary determination.

Referring to claim 35,

i. Determining a function of the horizontal projections of a binarized differential image is note explicitly explained by Wagner et al. However, Ueno et al illustrate a function of horizontal projections from a binarized difference image in figure 7B.

ii. Defining the left head boundary by the first maximum of the absolute value of the first derivative of the function that is above a predetermined threshold value is not explicitly explained by Wagner et al. However, Ueno et al explain that the transition points are only determined if the value of a horizontal projection is above a threshold in

column 7, lines 21-28. Ueno et al also illustrate in figure 7B that the first transition point is selected at the maximum of the absolute value of the first derivative of the function of horizontal projections. In figure 7B, the left transition point is selected at the point where the slope (corresponding to the absolute value of the first derivative) is at a maximum. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the left head boundary by the first maximum of the absolute value of the first derivative of the function that is above a predetermined threshold value, since the increase in the slope of the function of a difference image indicates the start of an area of motion.

Referring to claim 37, the function of the horizontal projections being smoothed with a low-pass filter prior to defining the head boundary is not explicitly explained by Wagner et al. However, Ueno et al illustrate a low-pass filter that reduces noise in figure 1 by reference number 103. The noise reduction filtering is performed before the determination of the peak of the projection of the difference image. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth the function of the horizontal projections prior to defining the head boundaries, so that false peaks due to noise do not adversely affect the head boundary determination.

Referring to claim 38,

i. Determining a function of the horizontal projections of a binarized differential image is note explicitly explained by Wagner et al. However, Ueno et al illustrate a function of horizontal projections from a binarized difference image in figure 7B.

ii. Defining the right head boundary by the first maximum of the absolute value of the first derivative of the function that is above a predetermined threshold value is not explicitly explained by Wagner et al. However, Ueno et al explain that the transition points are only determined if the value of a horizontal projection is above a threshold in column 7, lines 21-28. Ueno et al also illustrate in figure 7B that the first transition point is selected at the maximum of the absolute value of the first derivative of the function of horizontal projections. In figure 7B, the right transition point is selected at the point where the slope magnitude (corresponding to the absolute value of the first derivative) is at a maximum. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the right head boundary by the first maximum of the absolute value of the first derivative of the function that is above a predetermined threshold value, since the increase in the magnitude of the slope of the function of a difference image indicates the start of an area of motion.

Referring to claim 40, the function of the horizontal projections being smoothed with a low-pass filter prior to defining the head boundary is not explicitly explained by Wagner et al. However, Ueno et al illustrate a low-pass filter that reduces noise in figure 1 by reference number 103. The noise reduction filtering is performed before the determination of the peak of the projection of the difference image. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth the function of the horizontal projections prior to defining the head boundaries, so that false peaks due to noise do not adversely affect the head boundary determination.

Referring to claim 45, predetermined head boundaries being used to extract the head region if no head boundaries can be determined is not explicitly explained by Wagner et al. However, Ueno et al illustrate in figure 3 that a predetermined head boundary, represented by the symbol Δ, is used in order to define the head boundary when no head boundary is determined. By using a predetermined head boundary, the system of Wagner et al and Ueno et al can more accurately detect the head of a person in an image when there is substantial noise present in the image. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use predetermined head boundaries to extract a head region if no head boundaries are present in order to overcome the substantial noise.

Referring to claim 46, predetermine head boundaries being used to extract the head region if one of the head boundaries is not within predetermined limits is not explicitly explained by Wagner et al. However, Ueno et al explain in column 7, lines 21-45 that a predetermined head boundary is defined in order to extract the head of a person from an image. If the head boundary determined is outside of the range Δ, then the extent of the head boundary is limited to the predetermined amount, Δ. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use predetermined head boundaries to extract a head region when the calculated head boundary is outside the predetermined limits so that the probability of correctly extracting the head region is improved.

Referring to claim 47, one of the lower and the right and lower head boundary being defined such that the square head region is extracted from at least one of the corresponding individual image and differential images is not explicitly explained by Wagner et al. However, Ueno et al illustrate that both of the lower (Ye) and right (Xe) head regions is defined in order to

extract the head region from a difference image in figure 5. It would have been obvious to one of ordinary skill in the art at the time the invention was made to define one of the lower or the right head boundary regions in order to extract a square head region, since a square head region has four sides are requires four head regions, as illustrated by Ueno et al.

18. Claims 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Ueno et al, and further in view of Moeller et al (U.S. Patent No. 6,353,632).

Referring to claim 41, two consecutive individual images are only used for determining the intrinsic movements if a change between the two consecutive individual images is within a predetermined range is not explicitly explained by Wagner et al or Ueno et al. However, Moeller et al explain in column 5, lines 26-41 that system which determine the difference between to frames and determine whether that difference is greater than a threshold are well-known. By limiting the motion present between two frames, erroneous motion due to scene changes or other artifacts will be excluded in the intrinsic motion determination system of Wagner et al and Ueno et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determining the intrinsic movements in an image sequence only if a change between the two consecutive individual images is within a predetermined range, so that erroneous motion is not detected.

Referring to claim 42, a motional intensity being calculated for determining the change between two consecutive individual images is not explicitly explained by Wagner et al. However, Ueno et al illustrate determining a function which is a summation of all the binary pixel values of a difference image in figures 7B and 7C. The summation of the values of the function correspond to the magnitude of the motion present between two images. Therefore, it

would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the motional intensity to determine the change between two consecutive images in order to exclude erroneous motional intensity.

Referring to claim 43, the motional intensity is substantially calculated through the sum of the gray level of the differential image corresponds to claim 42, wherein the motional intensity is determined from the gray level representing black in the difference image illustrated by Ueno et al in figure 7A.

Referring to claim 44, the motional intensity is substantially calculated through the sum of the 1 pixel or the 0 pixel of the binarized differential image corresponds to claim 42, wherein the motional intensity is determined from the binarized difference image illustrated by Ueno et al in figure 7A.

19. Claims 52-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of Badiqué, Ueno et al, and Russ, and further in view of Moeller et al.

Referring to claim 52, two consecutive individual images are only used for determining the intrinsic movements if a change between the two consecutive individual images is within a predetermined range is not explicitly explained by Wagner et al or Badiqué or Ueno et al or Russ. However, Moeller et al explain in column 5, lines 26-41 that system which determine the difference between to frames and determine whether that difference is greater than a threshold are well-known. By limiting the motion present between two frames, erroneous motion due to scene changes or other artifacts will be excluded in the intrinsic motion determination system of Wagner et al, Badiqué, Ueno et al, and Russ. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determining the intrinsic

movements in an image sequence only if a change between the two consecutive individual images is within a predetermined range, so that erroneous motion is not detected.

Referring to claim 53, a motional intensity being calculated for determining the change between two consecutive individual images is not explicitly explained by Wagner et al. However, Ueno et al illustrate determining a function which is a summation of all the binary pixel values of a difference image in figures 7B and 7C. The summation of the values of the function correspond to the magnitude of the motion present between two images. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate the motional intensity to determine the change between two consecutive images in order to exclude erroneous motional intensity.

Referring to claim 54, the motional intensity is substantially calculated through the sum of the gray level of the differential image corresponds to claim 42, wherein the motional intensity is determined from the gray level representing black in the difference image illustrated by Ueno et al in figure 7A.

Referring to claim 55, the motional intensity is substantially calculated through the sum of the 1 pixel or the 0 pixel of the binarized differential image corresponds to claim 42, wherein the motional intensity is determined from the binarized difference image illustrated by Ueno et al in figure 7A.

20. Claims 48-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al in view of well-known prior art.

Referring to claim 48, a stabilized differential image is formed from two consecutive individual images and the image being evaluated for one of detecting the intrinsic movements

and extracting the regions in which intrinsic movements are to be detected is not explicitly explained by Wagner et al. However, it is well-known in the art to stabilize an image by registering two regions with each other so that a later comparison of the images is more accurate (official notice). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a stabilized differential image and evaluate the image for one of detecting the intrinsic movements and extracting the regions in which intrinsic movements are expected so that the intrinsic movements detected in the system of Wagner et al are more accurate.

Referring to claim 49, the stabilization being carried out by means of a correlation correction is not explicitly explained by Wagner et al. However, it is well-known in the art to stabilize an image by registering the two regions with each other (official notice). In order to register two images, it is also well-known to use a correlation correction in order to determine the degree of correlation between the two regions (official notice). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the stabilization by means of a correlation correction so that the intrinsic movements detected in the system of Wagner et al are more accurate.

Referring to claim 50, the correlation coefficient comprising template matching corresponds to claim 49, wherein one of the two regions is the template.

Referring to claim 51, the template matching comprising calculating a differential image, the first individual image being used for forming the differential image being shifted in the calculation of the differential image with respect to the second individual image used for forming the differential image in such a manner that a correlation function between the two individual

images is at a maximum is not explicitly explained by Wagner et al. However, exhaustive template matching, wherein the template is shifted across a second image in order to determine the region with the maximum correlation is well-known in the art (official notice). By performing exhaustive template matching, the region exhibiting the highest correlation between two images will be matched, at the cost of high computation power. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate a differential image, the first individual image being used for forming the differential image being shifted in the calculation of the differential image with respect to the second individual image used for forming the differential image in such a manner that a correlation function between the two individual images is at a maximum so that the intrinsic movements detected in the system of Wagner et al are more accurate.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Koike et al (U.S. Patent No. 6,181,805) – To exhibit determining a histogram of a binarized difference image as illustrated in figure 17.

Kavensky et al (U.S. Patent No. 6,421,453) – To exhibit employing behavioral passwords to authentic a user as explained in the abstract.

Kado et al (U.S. Patent No. 5,410,609) – To exhibit identifying users using facial recognition as illustrated in figure 3.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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March 6, 2004

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